Impact of Problem Representation on GA Performance: Point Scattering Problem

An investigation of the strengths and weaknesses of each problem representation

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Problem Representations

The point scattering problem is a mathematical problem that involves finding the probability of a point randomly scattered in each region. This report explores the impact of problem representation on GA performance on the point scattering problem by proposing three representations: point (x,y), point (x,y)’, and polar coordinates with theta. Each representation objective is to maximize the minimum distance between any pair of points to produce maximum fitness evaluation in finding the probability of a point randomly scattered in a given region.

1 Representation 1: Point XY

The first representation involves finding the optimal solution to a given set of points with the goal of arranging the points in sequential order. Algorithmically it extends the fitness function to calculate the probability of finding the best arrangement of points (x,y) with random selection and fixed parameters where the cross rate is 1.0 and mutation rate is 0.01. The probability of the GA performance is as follows:

Figure 1: Representation 1, n=10

**Results.** The results of representation 1 showed that when n increases the fitness slightly decreases.

Figure 1: Representation 1, n=25

Figure 1: Representation 1, n=50

1.1 Representation 3:

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1.1 Representation 3: Polar Coordinates

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